

AWL AIRCRAFT WARNING LIGHT

MIOL-B TYPE

OPERATION AND MAINTENANCE MANUAL

LUXSOLAR - AERONAUTICAL LIGHTING

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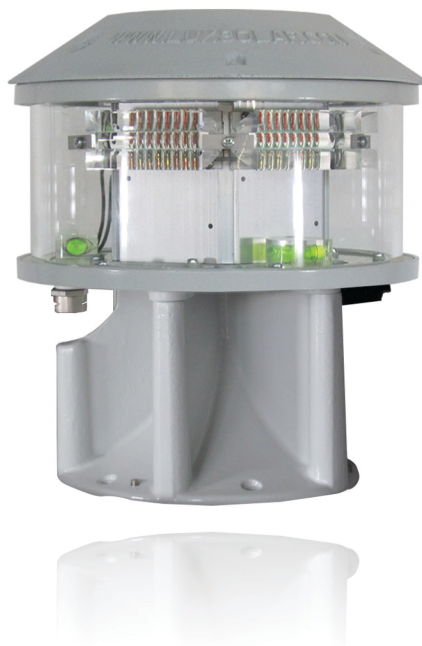
1. MIOL-B Datasheet, ordering code, weight and dimensions
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1) MIOL-B DATASHEET

AIRCRAFT WARNING LIGHTS

MEDIUM INTENSITY OBSTRUCTION LIGHT MIOL - B / MIOL - C



AWL - MIOL - B/C



rev_01

COMBUSTION AND ENERGY - info@luxsolar.com - www.luxsolar.com - Ph. +39.0341.260926



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AIRCRAFT WARNING LIGHTS

MIOL - B / MIOL - C

AWL - MIOL - B/C

KEY FEATURES

- Based on LED technology
- 2.000 cd night mode, RED flashing for MIOL-B
- 2.000 cd night mode, RED steady burning for MIOL-C
- Long life time >10+ years life expectancy
- Low consumption
- Stabilised light output
- Lightweight and compact
- Low wind load factor
- Alarm/remote status control
- Easy to install
- No RF-radiations
- Light output alignment device
- Patented beacon (EU 001929910-0001; Canada 145 189; USA D673,474)

OPTICAL FEATURES

- Cd emission @ -0,5° and +4°
- Horizontal beam radiation 360°
- Vertical beam spread 4°
- PMMA lens

OPTIONS

- Twin version: two galvanically separated circuits in the same fixture
- Anti bird protection
- Beacon support bracket
- Power supply AC or DC
- GPS (Global Position System) syncro
- Infrared available

ELECTRICAL FEATURES

- Average power consumption for MIOL-B (@20fpm): 9W
- Average power consumption for MIOL-B (@40fpm): 12W
- Average power consumption for MIOL-B (@60fpm): 15W
- Average power consumption for MIOL-C (steady burning) : 54W
- LED feeded at constant current
- Lightning protection

MECHANICAL FEATURES

- Anodised aluminium body with heat-sink for natural draft air cooling
- RAL7035 painted aluminium body lamp
- Bottom wind collector for central heat-sink cooling
- Borosilicate glass cover protection
- Silicon gasket
- Degree of protection: IP66
- Operating temperature: -45°C to +55°C
- Storage temp. range: -45°C to +55°C
- Lamp unit weight: 3,5kg

APPLY TO

- Airport - Stack - High building - Chimney - Tower crane
- Pipe line - Bridge - Radio and television tower
- Transmission line - Wind turbine - Wind mast measurement
- Radar - Antenna

INTERNATIONAL REGULATION

- ICAO Aerodromes -Annex 14 Volume 1, 6th Edition, July 2013 Chapter 6: Medium intensity, Type B flashing obstacle light MIOL-B type or Type C steady burning obstacle light MIOL-C type
- FAA AC150/5345-43F E.B. #67 Lamp type L-864 or Twin L-864
- DGAC/STAC approval nr. 2013A037
- CE marking



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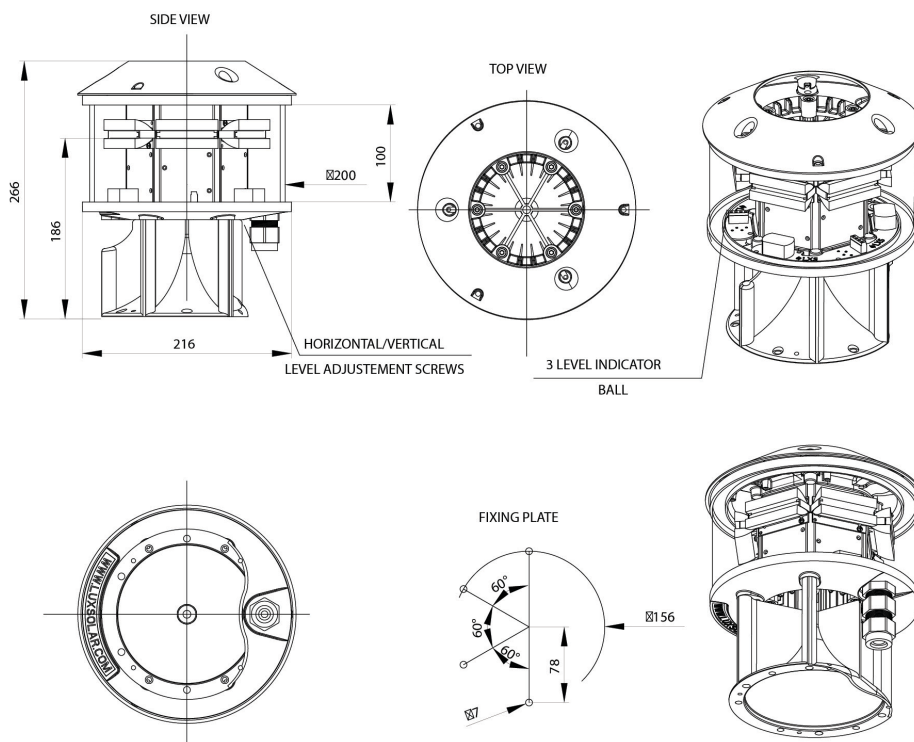
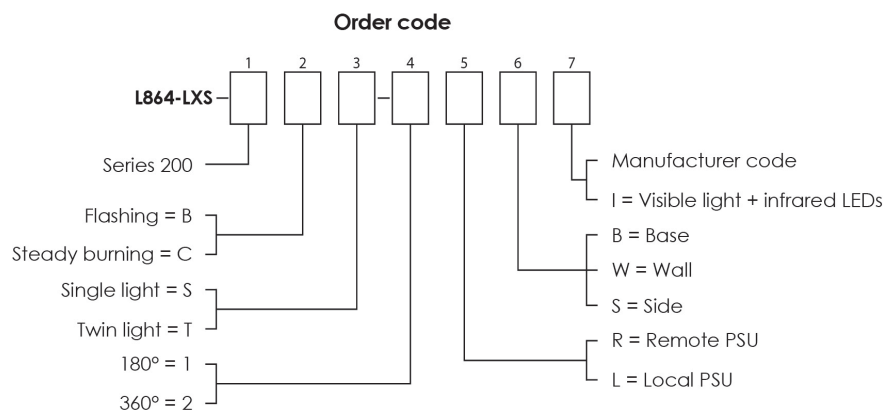
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AIRCRAFT WARNING LIGHTS

MIOL - B / MIOL - C



AWL - MIOL - B/C

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2) OVERVIEW

The beacons are pre-assembled in factory and can operate with their own power supply circuits.

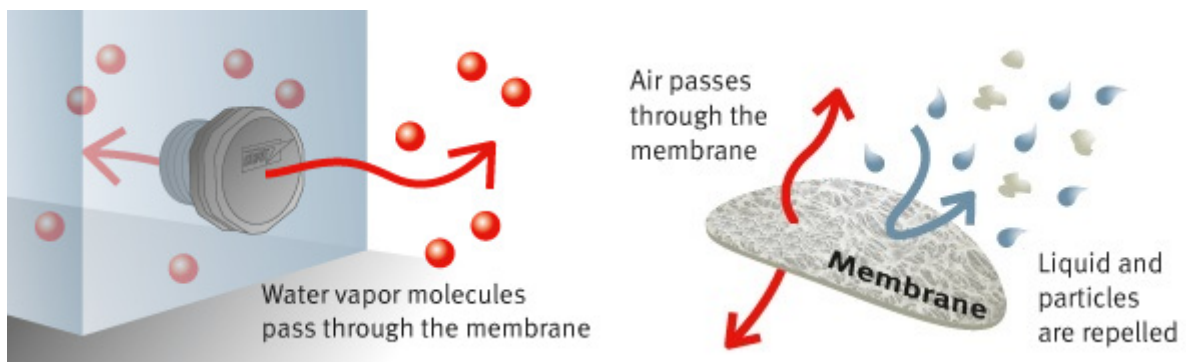
The necessary power feed the beacon is 1/10 of the power needed for the same beacon incandescent type.

This manual has to be read and understood before doing maintenance on the system or doing the start-up.

For the system functioning and first start-up, please refer to document F.A.T. included in the data book.

Each lamp has a special breathing valve to prevent moisture presence. This device:

- Equalizes pressures to protect housing enclosures and seals;
- Prevent contamination to protect electronics;
- Reduce condensation to protect against corrosion.



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3) ICAO RULES GENERAL CONCEPTS, TYPE OF LAMPS

Rules Reference:

- ICAO (International Standards and Recommended Practices), Annex 14, Aerodromes, Volume I, Aerodrome Design and Operations, sixth edition July 2013.
- ICAO Aerodrome Design Manual, Part 4, Visual AIDS, fourth edition 2004.
- ICAO Airport Service Manual, Part 9, Airport Maintenance Practices 1984, par. 2.6 Light Maintenance Procedure

The Aircraft Warning Lights (AWL) beacons are designed in accordance to ICAO rules. These rules define the all the optical characteristics of the lights, the number to be installed and the allowed configurations.

Please refer to the table below:

1	2	3	4	5	6	7
Light Type	Colour	Signal Type/ (flash rate)	Peak intensity (cd) at given Background Luminance (b)			Light Distribution Table
			Day (Above 500cd/m ²)	Twilight (50-500cd/m ²)	Night (Below 50cd/m ²)	
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	N/A	10	Table 6-2
Low-intensity, Type B (fixed obstacle)	Red	Fixed	N/A	N/A	32	Table 6-2
Low-intensity, Type C (mobile obstacle)	Yellow/Blue (a)	Flashing (60-90 fpm)	N/A	40	40	Table 6-2
Low-intensity, Type D (follow-me vehicle)	Yellow	Flashing (60-90 fpm)	N/A	200	200	Table 6-2
Medium-intensity, Type A	White	Flashing (20-60 fpm)	20.000	20.000	2.000	Table 6-3
Medium-intensity, Type B	Red	Flashing (20-60 fpm)	N/A	N/A	2.000	Table 6-3
Medium-intensity, Type C	Red	Fixed	N/A	N/A	2.000	Table 6-3
High-intensity, Type A	White	Flashing (40-60 fpm)	200.000	20.000	2.000	Table 6-3
High-intensity, Type B	White	Flashing (40-60 fpm)	100.000	20.000	2.000	Table 6-3

* Document extract from ICAO Annex 14, Aerodromes, Volume I, Table 6-1. "Characteristics of obstacle lights" *

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As you can see there are three big categories of lights: low, medium and high intensity type.

The differences are related to the intensity of lights, colours, flashing or fixed and when the lamps are on or off during the day/night.

Some combinations of lights are also possible, for example medium intensity type AC. In this case the lamp will be white flashing during the day and red flashing during the night.

If the lamps are flashing type and installed on the same structure they have to be synchronized.

On the light intensity of medium and high lamps type there is a tolerance of $\pm 25\%$.

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4) MIOL-B LAMPS EMISSION TESTS.

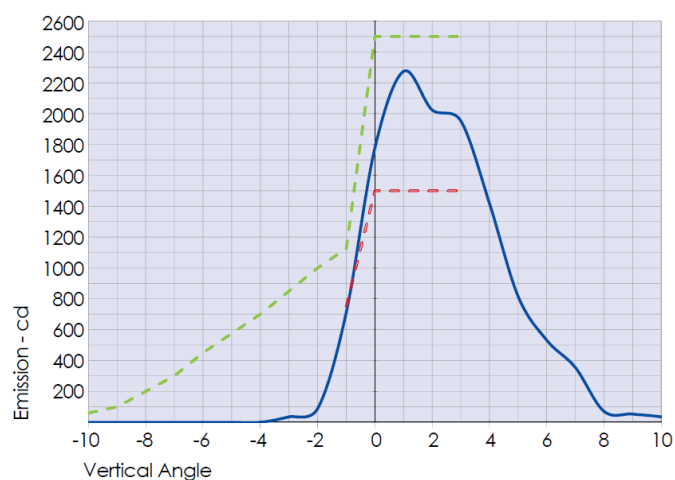
The Medium Intensity Obstruction Lights (MIOL) for these systems are B type, with 360° radial emission. This means that they have the following intensity:

- Switch off during daytime
- 2.000cd red flashing during night time

Reference code number: L864-LXS-B

Night mode (red flashing):

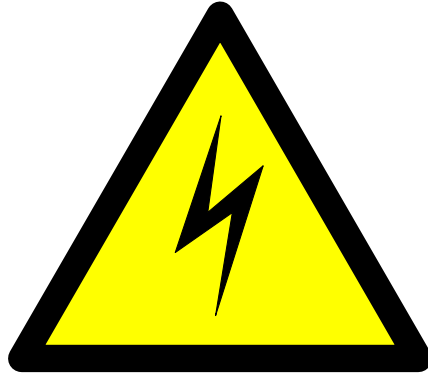
	<i>Minimum</i>	<i>Maximum</i>
<i>Measured Intensity (cd)</i>	2.779	3.479



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5) SAFETY NOTICE.

DANGER - ELECTRICAL VOLTAGE



The AWL system associated with the supplied equipment uses 230Vac (as option 24Vdc) and 170Vdc voltage to supply the beacons. This voltage is present all the AWL panels and also inside all the beacons.

In addition some components inside the AWL panels contain capacitors that will retain their charge for several minutes after the main power has been switched off.

To avoid risk of injury we recommend the following precautions:

- Maintenance should only be undertaken by qualified, experienced personnel, familiar with the equipment involved.
- After isolating the power supply wait at least 5 minutes before opening the panel. This allows the capacitors to drain their charge.
- Ensure the system is electrically isolated before attempting maintenance on cables.

DANGER – HIGH BRIGHTNESS

Do not look directly the light source (LED) during system functioning. Considering the high brightness of this source there is an high risk to be dazzled and/or to have temporary or permanent sight injury.

If during maintenance it will be necessary to leave the light on, it will be mandatory to use adequate protection glasses, for the whole time.

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6) TYPE GENERAL LAYOUT AND SYSTEM DESCRIPTION.

MIOL-B AWL systems is used when the structure is lower than 105m.

The lights are installed on the top of the structure RED AND WHITE MARKED and composed of the following material.

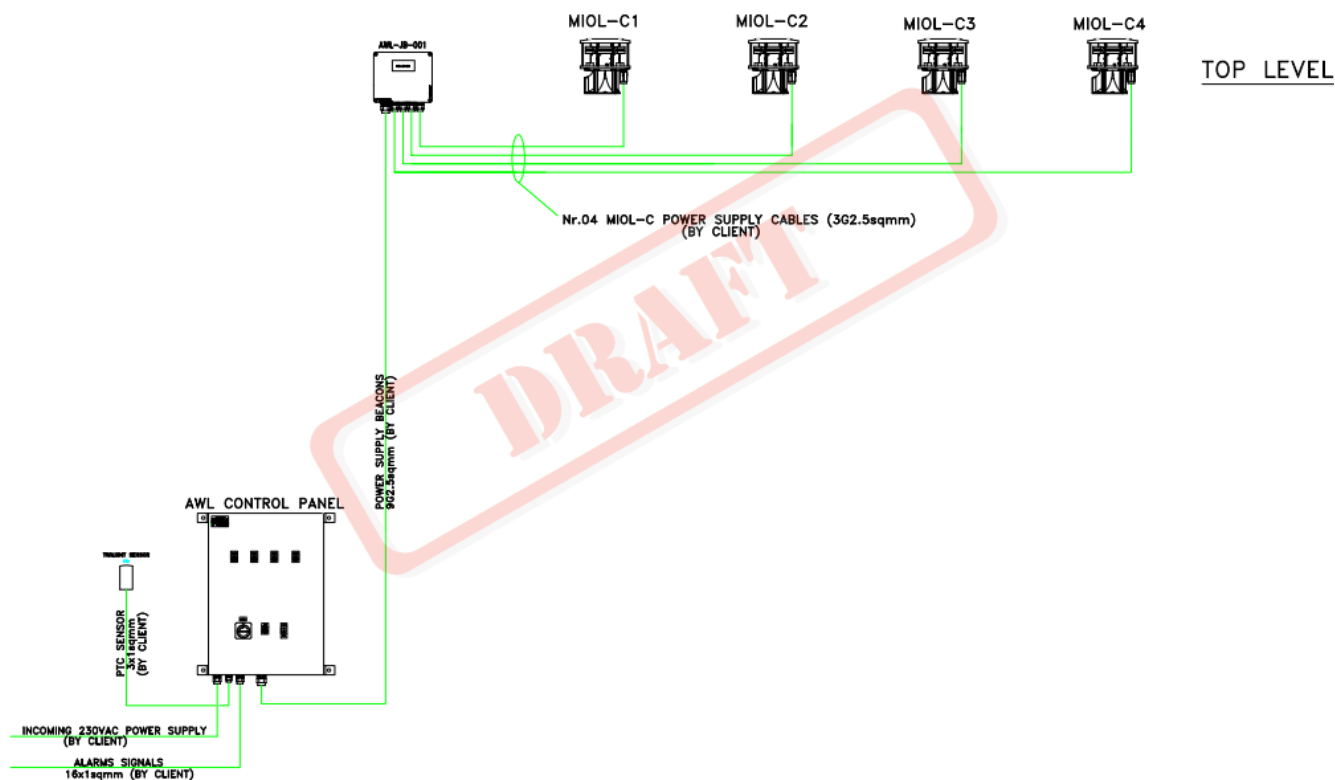
At base structure:

- Nr.01 Base AWL Panel
- Nr.01 Twilight Sensor

At top level:

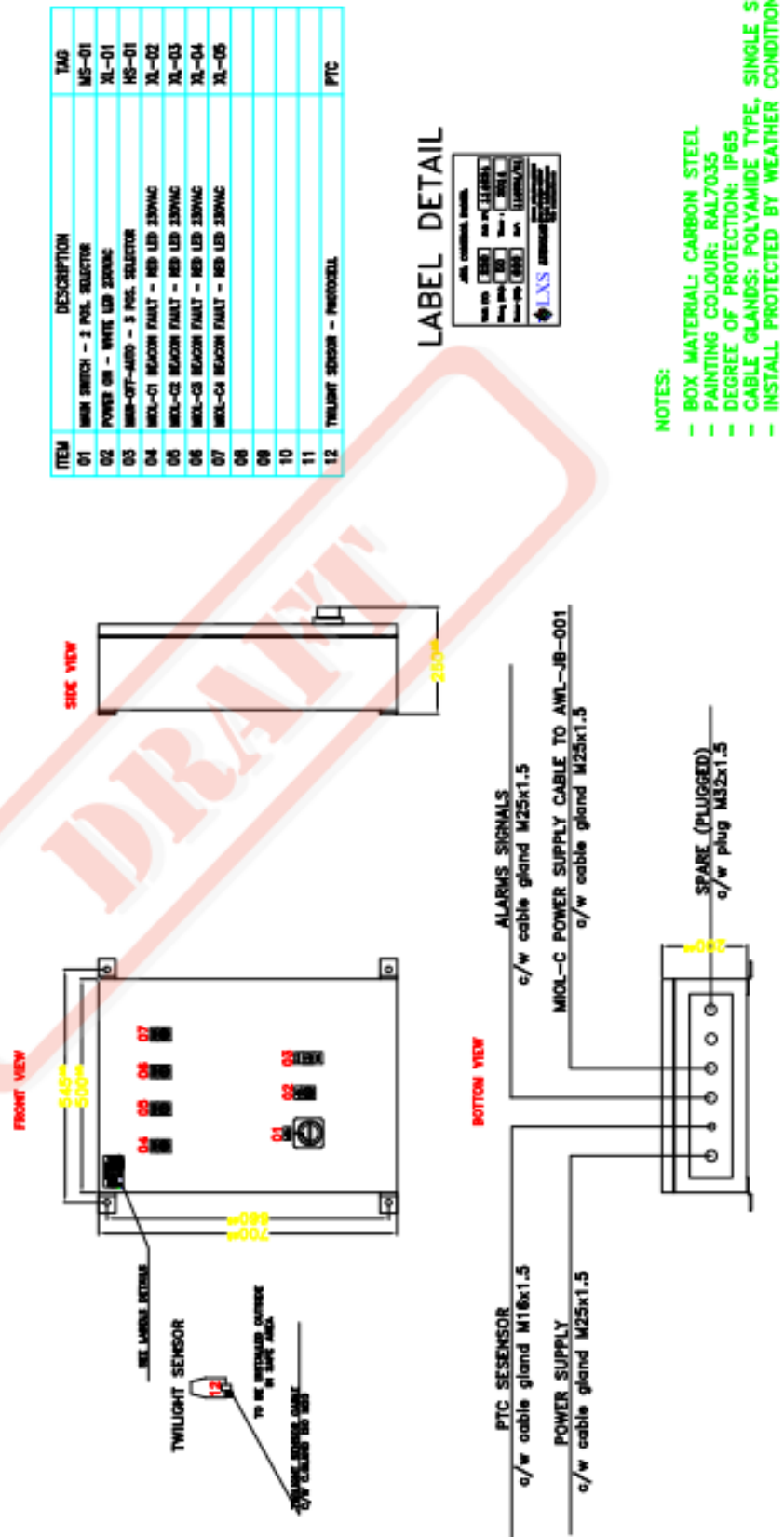
- Nr.01 or 03 or 04 MIOL-B beacons (depend of the shape and diameter of the structure)

In the next page it is shown the typical interconnection diagram of the systems. For further details please refer to the dedicated electrical drawing.



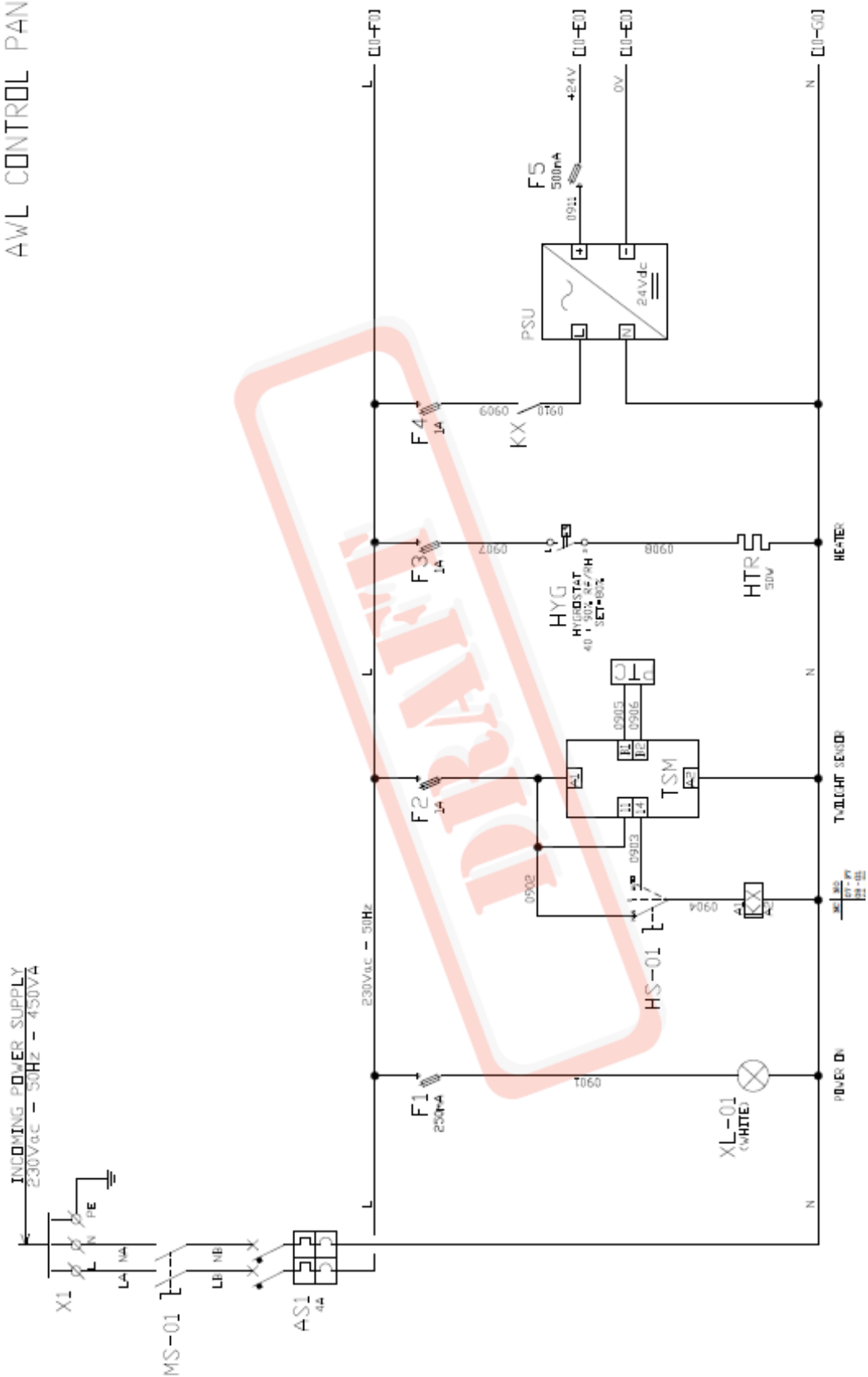
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AWL CONTROL PANEL EXTERNAL LAYOUT

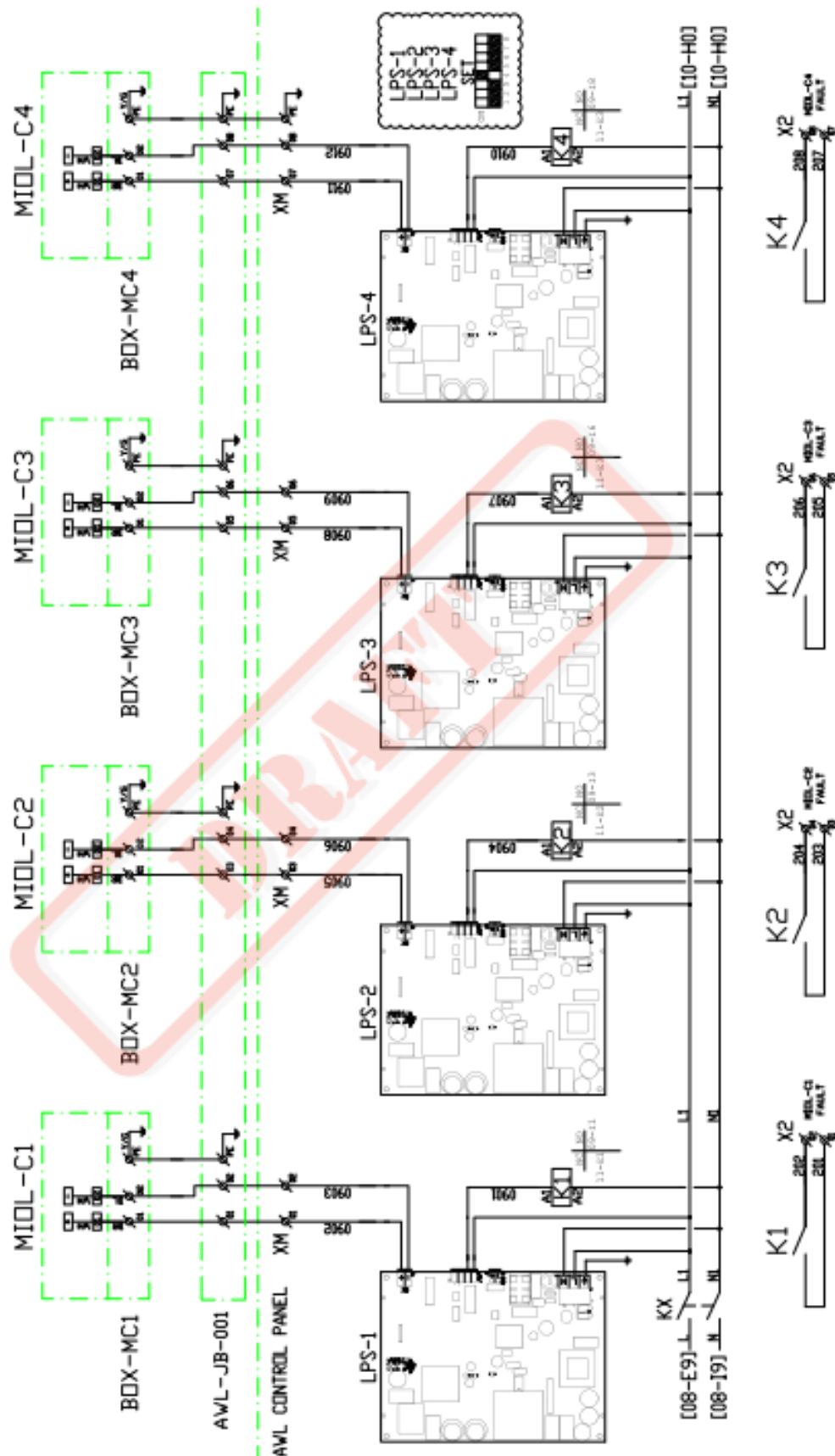


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AWL CONTROL PANEL



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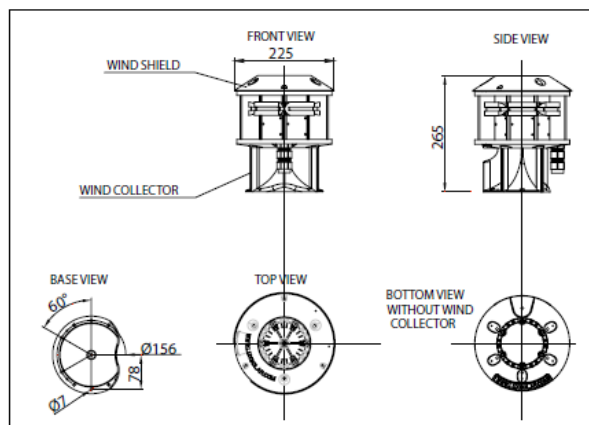
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7) FIXING DETAILS

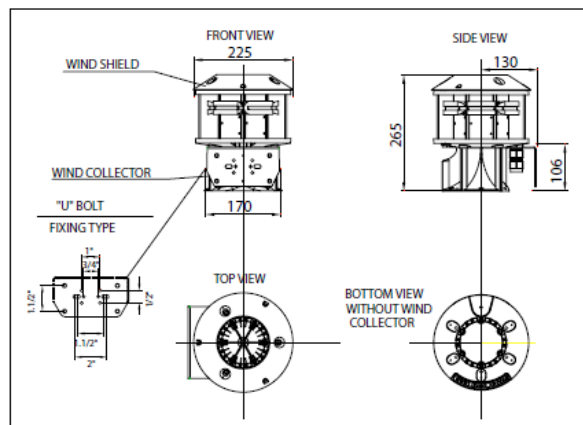
Each beacon can be fixed to the structures in difference way, see details below:

MEDIUM INTENSITY TYPE B (L864-LXS-B)

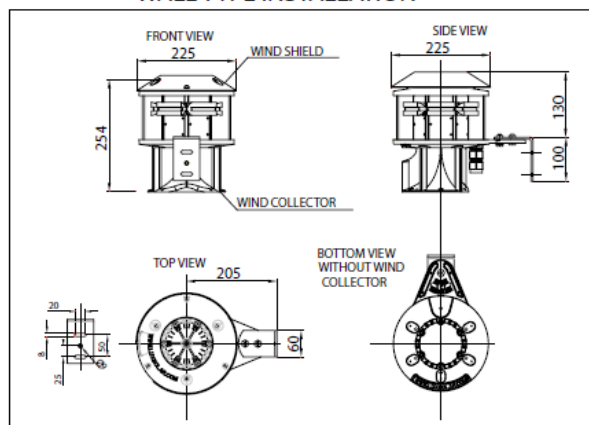
BASE TYPE INSTALLATION



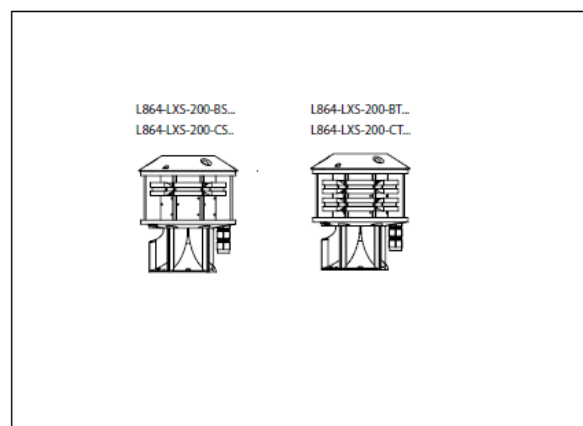
SIDE TYPE INSTALLATION



WALL TYPE INSTALLATION



TYPES AVAILABLE



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8) AWL SYSTEMS OPERATIONS

The AWL system is designed to work for night mode only. During normal operation all the MIOL-B beacons are flashing, accordingly to the light condition. It is power supplied with 230Vac 50/60Hz voltage, 1 phase + neutral (or 24Vdc as option). The voltage have to be sinusoidal (in Vac version only) so no square UPS input voltage nor diesel generator type are allowed.

There are Nr.02 functional modes of the system.

- Day mode: all MIOL-B beacons are switched OFF.
- Night mode: all MIOL-B beacons are flashing with 2.000cd intensity. The changing from all of these modes is made automatically by the system, through the twilight sensor. This device has to be installed in a safe area, where artificial light is not present (to avoid false reading). It detects the light difference between day and night, so it switches the system into the correct mode. During tests phase or commissioning it is possible to "force" the mode condition by covering or illuminating the sensor. The sensor has an hysteresis of about 1 minute on the reading, so the change is not immediate.

For the start-up please refer to the step by step instruction included in the FAT document

Each MIOL-B beacon is power supplied with Nr.01 electronic boards, code ATB150-LXS for 230Vac inlet or ATC150-LXS for 24Vdc inlet (LPS components in the drawings)
These boards make the LEDs steady burning and they also check the lamp status. For further details please refer to next Section 9.

Once the system has been switched on and tested, it works automatically using the twilight sensor, so it is not necessary to change the mode status manually.

In case of system with multiple light, on the AWL Control Panel can be installed fault status lamps (one for each beacon, or fault beacon level). Inside the panel there are also fault signal contacts, again one for each lamp. When all the beacons are working correctly the signalling lamps are off and the contact are closed. Instead if one or more lamps are faulty the corresponding signalling lamp switches one while the contact opens. For further details please refer to next Section 9.

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9) FAULT DETECTION, ELECTRONIC BOARD DETAILS AND SETTING.

Each MIOL-B beacon is power supplied with Nr.01 electronic boards, code ATB150-LXS for 230Vac or ATC150-LXS for 24Vdc (LPS components in the drawings). These boards make the LEDs flashing and they also check the lamp status. They work all together only during the day and they are divided as per below:

- Electronic boards LPS-1/2/3 work only during night mode

They have Nr. 08 DIP switches and the correct configuration is the following:

For all LPS-1/2/3:

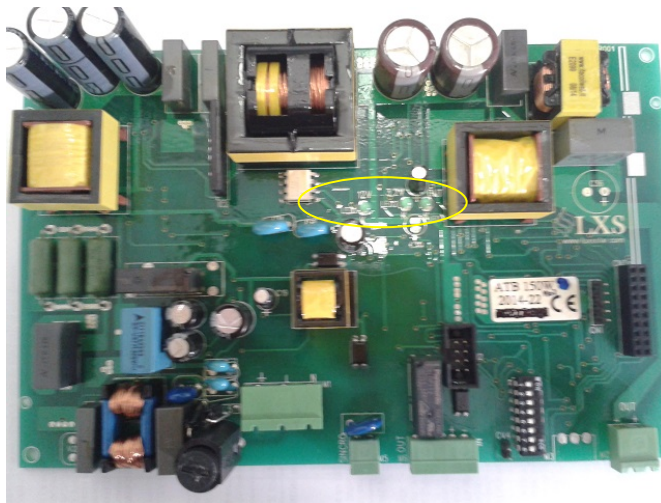
- DIP 1 = DIP 2 = DIP 3 = DIP 6 = DIP 7 = DIP 8 = OFF
- DIP 4 = ON

The electronic board check continuously the beacon status and in case of fault it switches on automatically the fault signalling lamps and the fault contact. The fault condition is activated even if only one of the two boards detect a fault condition.

In addition:

- They have a glass fuse on the input circuit
- They have the input circuit electrically insulated from the output one
- They have an input
- They are protected against reverse connection
- They are protected against LED short or open circuit

Once the system detect fault condition it is possible to understand visually which is the electronic board in this condition. Please refer to the highlighted LEDs on the picture below:



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LED1 and LED2 refer to the power supply circuit so once the system is power supplied they have to be on and fixed. Instead LED3 refers to the output so in this case we have three conditions:

- Normal operation: it is on and it flashes according to the MIOL-B lamps. The flash of all LED3 leds is synchronized.
- Faulty operation: it is on and it flashes very fast, with very weak light. The flash is not synchronized with the other LED3 leds.
- Third condition: it is off because it refers to an electronic board that doesn't have to work in the current mode (for example a day board during night).

Once the fault condition is detected please contact our technical office by phone or email for further assistance.

Electronic board PSU regulatory compliance

The AT-150-LXS LED DRIVER PSU, is designed to allow the Warning Beacons to comply with ICAO rules, and FAA, EASA specifications.

The AT-150-LXS LED DRIVER PSU, is designed according to the directive:

2004/108/EC Electromagnetic Compatibility

the conformity is given by the compliance of the following European Standards:

EN 61547 – Lighting devices, EMC immunity

EN 61000-3-2 - (EMC) Part 3.2 EMC limits for current <16A on each phase

CEI EN 55015 limits for radioemissions on lighting

2006/95/EC Low Voltage Directive

the conformity is given by the compliance of the following European Standards:

EN 61347-1 *Lamp Controlgear, part 1 general and safety requirements*

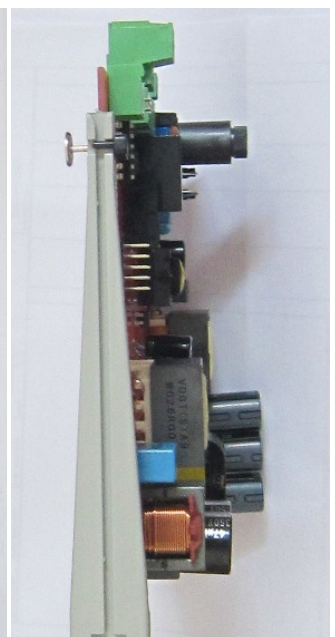
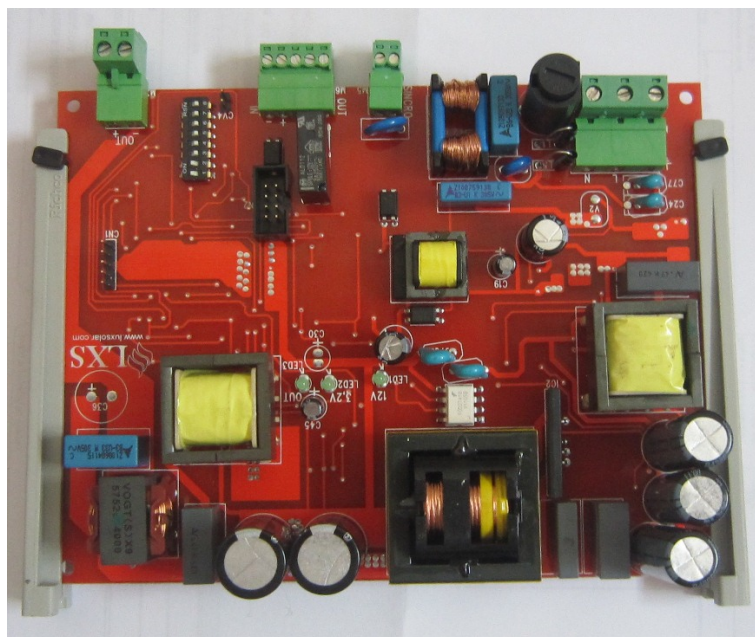
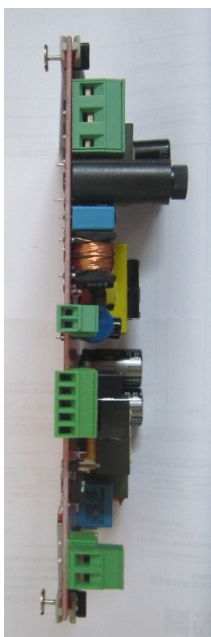
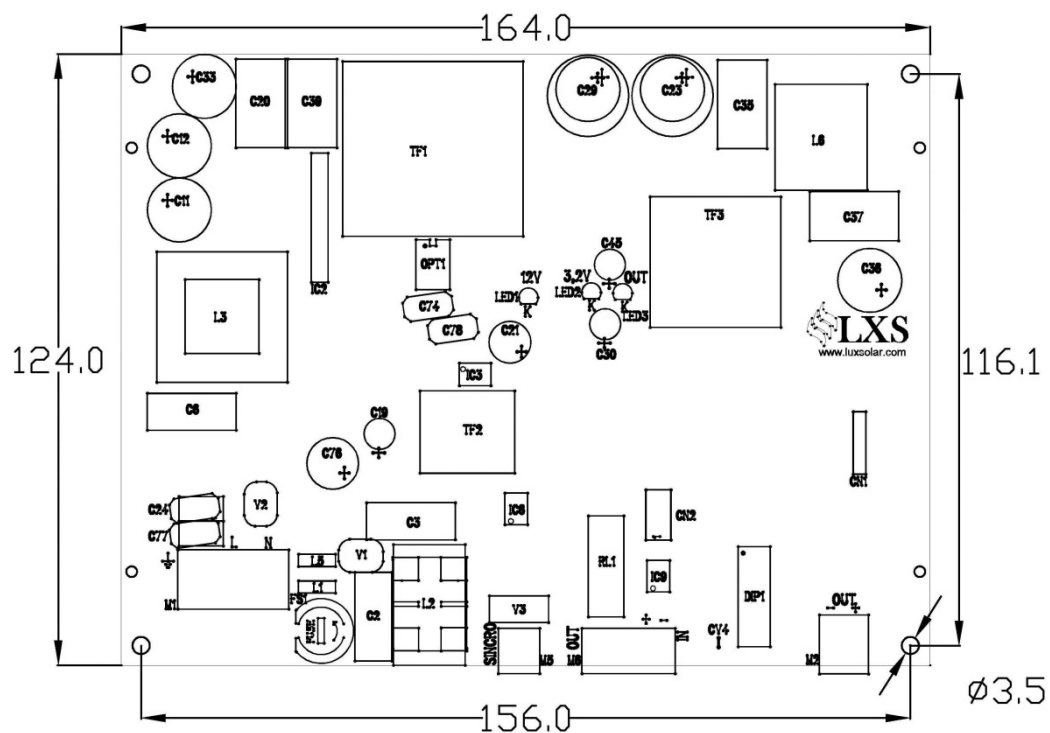
EN 61347-2-13 *Lamp Controlgear, part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules*

Combustion and Energy srl, as manufacturer of AWL beacons, and relevant Driver Circuits declares to operate in accordance with EN-ISO-9001:2000 (cert nr. IQ-1200-15), and 89/392/CEE, 91/368/CEE, 93/44/CEE, 93/68/CEE directives.

Combustion and Energy srl, as manufacturer of AWL beacons, and relevant Driver Circuits inform that the above part of devices can not be in service before that the full device, on which it will be incorporated, as to be declared in conformity to the rules 89/392/CEE.

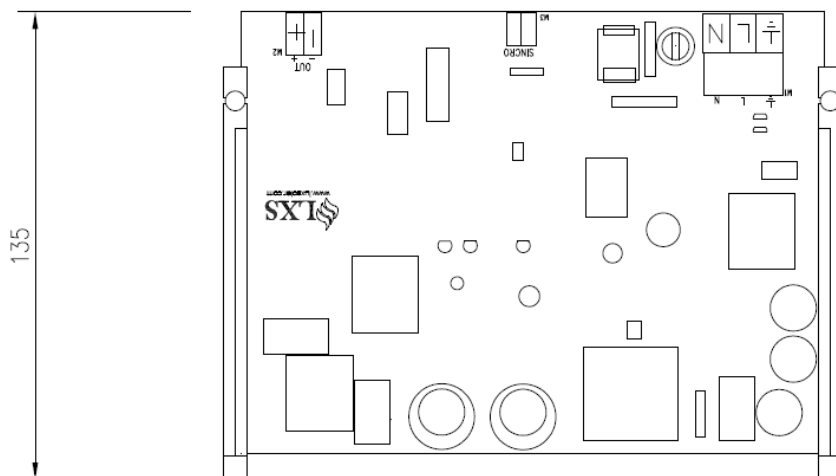
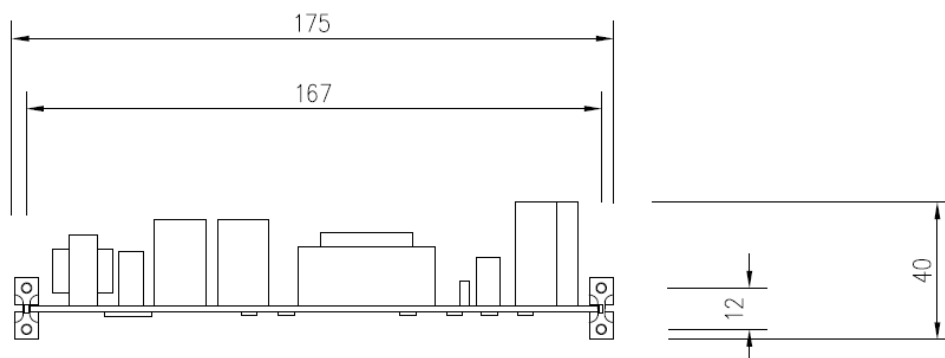
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PSU LAYOUT



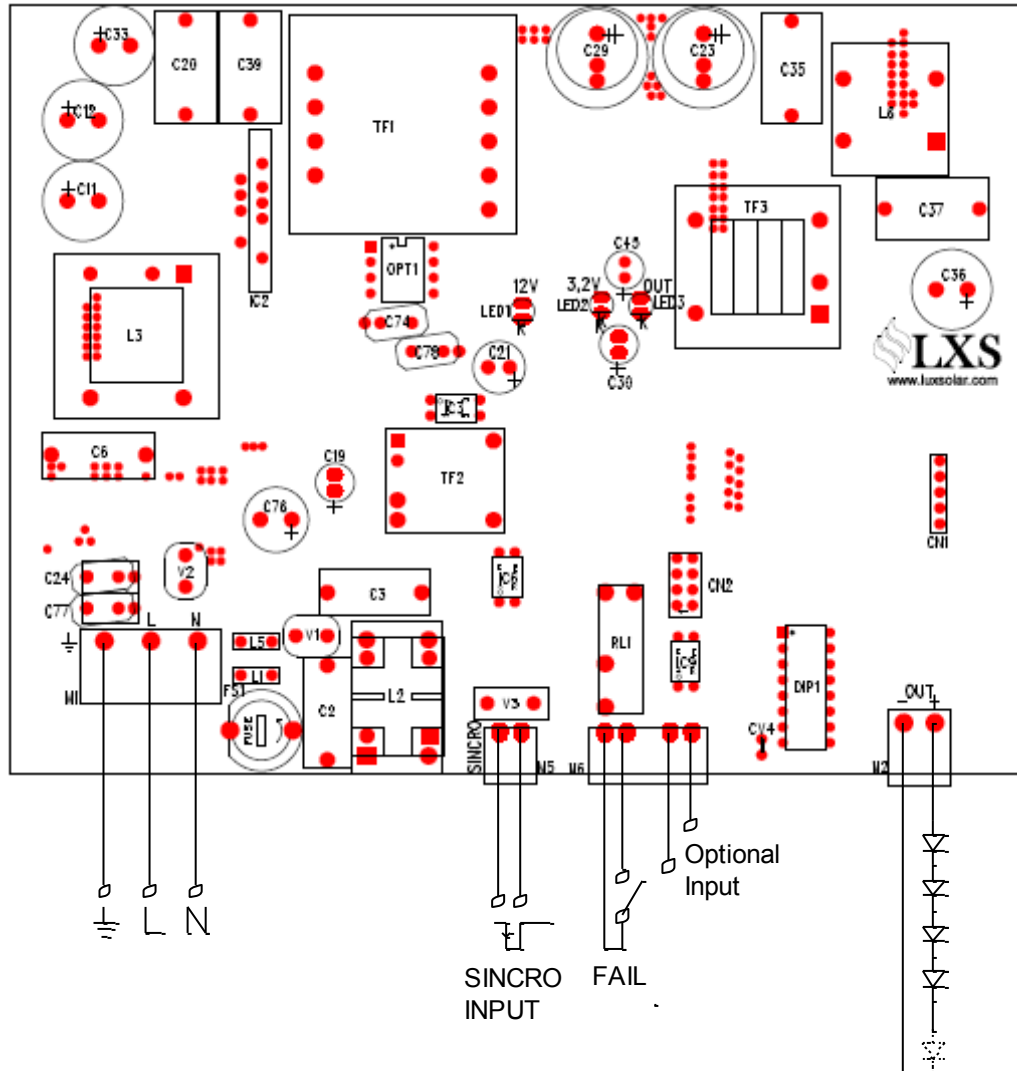
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FIXING POINT FOR RACK MODE



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CONNECTIONS



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MAIN DATA

- OUTPUT VOLTAGE:
No Load: Max output voltage = 210 VDC
With Load: Max Output working voltage = 150VDC
- Self Protected circuit against LED reverse polarity connection
- Self Protected circuit against LED short circuit
- Auxiliary Alarm Relay (de energized for alarm or no power)
- Protection Fuse (5x20; 3,15 AT) on inlet phase
- Synchronizations flash output available via AC Net
- For 115Vac application, add autotransformer input 115Vac output 230Vac (optional)
- Continuous power supply 100-130 V dc for max 60W (dip switch 1 & 2 must be set at 0);
200/260 Vdc for max 150W.
- Inrush current: select D curve as for motor starter, or delayed fuse.
- If the AT150 electronic is powered without LEDs connected, the AT150 will enter in safe mode within 500ms; than no power will be available at LED output, even if LED are reconnected. To feed the LEDs, please disconnect power supply, wait at least 2 seconds and reconnect power supply.
- The AT150 has been designed to be connected to expansion card for dimming and for communication.

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PSU CARD Dip Switch setting

1	2	3	4	5	6	7	8	Jumper	Note	Function
0	0									Output for MIOL-B & C
1	0									Output not to be used
0	1									Output not to be used
1	1								1	Output for MIOL-A (multiple cards are required)
		0								Automatic Syncro
		1							2	External Syncro
			0							Flashing light (internal or external syncro)
			1							Steady burning light (bypass syncro)
				0	0					Not to be used
				1	0					200mS ramp 14 mA/mS
				0	1				3	Not to be used
				1	1				3	Not to be used
						0	0			Frequency flashing 20 flash/min
						1	0			Frequency flashing 40 flash/min
						0	1		3	Frequency flashing 50 flash/min
						1	1		3	Frequency flashing 60 flash/min
								0		Normal functionality
								1		Acquisition Aux signal during the start

1. Only for flashing selection; if steady burning set, current will be automatically reduced
2. Dip switch 7 & 8 will not be readied if external syncro is selected.
3. Not applicable for MIOL-A. if set, current will be automatically reduced

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10) MAINTENANCE.

AWL beacons maintenance has to be done in accordance with ICAO rules:

**Airport Service Manual
Part 9
Airport Maintenance Practices
1984
par.2.6 Light Maintenance Procedure**

Maintenance procedure can be resumed as follow:

1) AWL beacons cleaning intervention:

Dust and sand brought by wind to the beacons, often reduce the intensity of the light so they have to be removed. The same thing has to be done for water left on the glass by bugs.
For this reason every two months it is necessary to clean the Beacons glass, with water and suitable fluids. Pay attention!! Do not use corrosive or oily products.
If there will be meteorological phenomenon with dust, the beacons cleaning is required.

2) Damaged beacon replacement

As soon as the broken beacon is detected, replace it immediately with a new one. Do not try to repair it on quote; test and repair the beacons only in laboratory.

3) Periodic check

Climatic conditions, lens degrade and the reduction of the intensity emitted from light source are the causes of possible reduction of the intensity of AWL beacons.
ICAO rules provide that if the light intensity is reduced under the 50% of the specified value, it is necessary the replacement of the beacon.
By the way it is strongly prompted to replace the beacon if the light intensity is less than 70%.
A simple light sensor, used overnight, can indicate the light intensity value, that has to be compared with the ICAO one.

The optimum working period of AWL beacons (LED type) can be define in 5 years before beacons replacement.

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MAINTENANCE MODULE

Please send us this report every six months, starting from bill of materials date, at Luxsolar by fax nr. +39 0341 577747.

Others way of sending will not be considered. The compilation of this module is necessary for the warranty.

Date of document:/....../.....

Person in charge:

Company:

Report number:

Device	State of functioning and preservation			Notes
	Very good	Good	Damaged	
MIOL-C LED beacons				
Control panels				
Internal wiring				
Twilight sensor				
Interconnection cables				

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11) TROUBLESHOOTING.

Very important! Some of the tests below have to be done with live system. For this reason they should only be undertaken by qualified, experienced personnel, familiar with the equipment involved.

Preliminary tests to be done without power supply:

- Verify the interconnection cables installation (correct pins, bolts tighten etc.)
- Verify that all green connectors on all electrical devices inside the panel are fixed correctly to the related electronic boards
- Verify that all the fuses integrity
- Verify that all the automatic switches are in ON position
- Verify that the system receive 230Vac power supply (or 24Vdc as option)
- Verify if black burnt mark are present on electrical components

Please find here below some fault conditions, with dedicated solution. All the operations that require replacement of components have to be done without power supply.

- *Fault* = all MIOL-C beacons are off
Probable causes = there is no electrical power supply to the system, automatic switches into off position, main switch into 0 position, fused terminals open
Solutions = give power supply to the system, turn automatic switches into on position, turn main switch into 1 position, close fused terminals
- *Fault* = one MIOL-AC or MIOL-C beacon is in fault condition
Probable causes = there is no electrical power supply to the lamp, one or more electronic board are in fault, damaged LEDs inside the beacon, wrong interconnection
Solutions = give power supply to the lamp, replace the electronic board, replace the beacon, change the interconnection

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12)MIOL-B TESTS: ICAO CERTIFICATION, IP65 TEST, VIBRATION TEST, CLIMATIC TEST REPORT

ICAO TEST REPORT



MINISTÈRE DE L'ÉCOLOGIE, DU DÉVELOPPEMENT DURABLE
ET DE L'ÉNERGIE



CERTIFICATE OF COMPLIANCE Aeronautical ground lighting N° 2014A018

Cancel and replace the certificate 2013A037 issued on 7th June 2013.

For the following ground lighting :

Type	Medium intensity obstacle light, type B
Brand	Luxsolar
Name	L864-LXS-CG-B
Lighting source(s)	48 LED Cree
Power supply	230V AC
Color	Red
Temperature range	[-20°C ; -45°C]

Issued to **Combustion and Energy SRL**

Referring to the obstacle lighting requirements **PRO/STAC/SE/VIS/6003**, V4 (25/01/2013)

By **Service Technique de l'Aviation Civile**, 23rd September 2014.

This certificate of compliance is only issued for the ground lighting described above. Any other ground lighting resulting from any changes to this latter must be submitted to the STAC approval.

laboratoire-photometrie@aviation-civile.gouv.fr

www.stac.aviation-civile.gouv.fr

Full report is available under request



COMBUSTION AND ENERGY SRL

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LUXSOLAR - AERONAUTICAL LIGHTING

IP65 TEST REPORT



TEST REPORT

Degrees of protection provided by enclosure (IP code)

IPTR_140870-0

Degrees of protection against solid foreign object	
Model and/or type reference	Aircraft Warning Lights beacons
Testing location	Prima Ricerca & Sviluppo
.....	Via Boscone, 68 - 22077 Olgiate Comasco (CO) Italy
Date	2014-07-11

Degree IPnX	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input checked="" type="checkbox"/>
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TEST CONDITION			
Ambient temperature	22 °C	Test means	Dust Chamber
Depression	≤20mBar	Duration of test	8 hour

Remark	Verdict
No ingress of dust inside the enclosure.	Pass

Date of issue:
2014-07-11

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LUXSOLAR - AERONAUTICAL LIGHTING



TEST REPORT Degrees of protection provided by enclosure (IP code)

IPTR_140870-0

Degrees of protection against water	
Model and/or type reference	Aircraft Warning Lights beacons
Testing location	Prima Ricerca & Sviluppo
.....	Via Boscone, 68 - 22077 Olgiate Comasco (CO) Italy
Date	2014-02-11

Degree IPXn	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8
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TEST CONDITIONS			
Ambient temperature	22° C	Test means	water jet hose nozzle
Water temperature	20° C	Water level	---
Pressure of the water	12,5 l/min	Duration of test	3 minutes

Remark	Verdict
No ingress of water inside the enclosure	Pass

Date of issue:
2014-07-11


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Full report is available under request



LUXSOLAR - AERONAUTICAL LIGHTING

VIBRATION TEST REPORT

	Test report n.	597-QL14-R01 ver. 0
	Applicant	COMBUSTION AND ENERGY SRL Via per Dolzago, 21 23848 Oggiono (LC) - Italia
	EUT/Type	MIOL-AB (L864/865-LXS-200)

TEST REPORT Nr. 597-QL14-R01 ver. 0

GENERAL INFORMATION INFORMAZIONI GENERALI	
Addresses Indirizzi	
Applicant Richiedente	COMBUSTION AND ENERGY SRL Via per Dolzago, 21 23848 Oggiono (LC) - Italia
Manufacturer Produttore	Same as applicant Vedi richiedente
Test laboratory Laboratorio di prova	Qualilab s.r.l. Via Trento, 87 25020 – Capriano del Colle (BS)
Dates Date	
Report Date Data preparazione rapporto di prova	Ver.0: 30/07/2014
Equipment under test Dispositivo sottoposto a prova	
Equipment under test Dispositivo sottoposto a prova	Aircraft Warning Lights beacons
Type: Modello:	MIOL-AB (L864/865-LXS-200)
Markings: Marche:	n.a.
Date of receipt: Data ricevimento:	Not relevant for the scope of the test
Date and method of sampling: Data e metodo di campionamento:	Sampling performed by the applicant/campionamento ad opera del richiedente
Applicable norms Norme applicabili	
EN 60068-2-6:2008 and applicant requirements	

The test results and observations indicated in this test report refer exclusively to the samples tested. It is not permitted to transfer the results to other systems or configurations.


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I risultati e le osservazioni indicate in questo rapporto di prova sono riferite esclusivamente ai campioni testati. Non è permesso utilizzare i risultati e le osservazioni di questo rapporto di prova per altri sistemi o configurazioni.

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QUALILAB s.r.l. Via Trento, 87 25020 - Capriano Del Colle (BS) info@qualilab.it www.qualilab.it


LUXSOLAR - AERONAUTICAL LIGHTING

	Test report n.	597-QL14-R01 ver. 0
	Applicant	COMBUSTION AND ENERGY SRL Via per Dolzago, 21 23848 Oggiono (LC) - Italia
	EUT/Type	MIOL-AB (L864/865-LXS-200)

TEST AND RESULTS PROVE E RISULTATI			
Test name Identificazione prova	Test Procedure Procedura di prova	Test requirement Requisito di prova	Result Esito
Sinus Vibration Vibrazione sinusoidale	EN 60068-2-6:2008 Frequency range 5-150 Hz peak to peak Amplitude 7,5 mm Amplitude 20 m/s ² N° 10 sweep/axis Vertical, transversal and longitudinal axis 1 oct/min sweep rate Sample not powered during test Campo di frequenze 5-150Hz ampiezza picco-picco 7,5 mm Ampiezza 20 m/s ² N° 10 cicli/asse Asse verticale, trasversale, longitudinale Velocità ciclo 1 oct/min Campione non alimentato durante la prova	Visual inspection (checking for detachment of the optical system) Ispezione visiva (verifica che il sistema ottico non si stacchi o danneggi)	PASS CONFORME
Sinus Vibration Vibrazione sinusoidale	EN 60068-2-6:2008 Frequency range 5-150 Hz peak to peak Amplitude 15 mm Amplitude 40 m/s ² N° 10 sweep on Vertical axis 1 oct/min sweep rate Sample not powered during test Campo di frequenze 5-155Hz ampiezza picco-picco 15 mm Ampiezza 40 m/s ² N° 10 cicli su asse verticale Velocità ciclo 1 oct/min Campione non alimentato durante la prova	Visual inspection (checking for detachment of the optical system) Ispezione visiva (verifica che il sistema ottico non si stacchi o danneggi)	PASS CONFORME
Sinus Vibration Vibrazione sinusoidale	EN 60068-2-6:2008 Frequency range 10-150 Hz peak to peak Amplitude 22 mm Amplitude 60 m/s ² N° 10 sweep on Vertical axis 1 oct/min sweep rate Sample not powered during test Campo di frequenze 10-150Hz ampiezza picco-picco 22 mm Ampiezza 60 m/s ² N° 10 cicli su asse verticale Velocità ciclo 1 oct/min Campione non alimentato durante la prova	Visual inspection (checking for detachment of the optical system) Ispezione visiva (verifica che il sistema ottico non si stacchi o danneggi)	PASS CONFORME

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LUXSOLAR - AERONAUTICAL LIGHTING

	Test report n.	597-QL14-R01 ver. 0
	Applicant	COMBUSTION AND ENERGY SRL Via per Dolzago, 21 23848 Oggiono (LC) - Italia
	EUT/Type	MIOL-AB (L864/865-LXS-200)

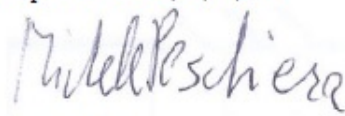

Sinus Vibration Vibrazione sinusoidale	<p>EN 60068-2-6:2008 Frequency range 10-150 Hz peak to peak Amplitude 30 mm Amplitude 80 m/s² N° 10 sweep on Vertical axis 1 oct/min sweep rate Sample not powered during test</p> <p>Campo di frequenze 10-150Hz ampiezza picco-picco 30 mm Ampiezza 80 m/s² N° 10 cicli su asse verticale Velocità ciclo 1 oct/min Campione non alimentato durante la prova</p>	<p>Visual inspection (checking for detachment of the optical system)</p> <p>Ispezione visiva (verifica che il sistema ottico non si stacchi o danneggi)</p>	PASS CONFORME
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STATEMENT

The Test Report comprises 6 pages.
The English version is the only official version of this test report

Questo rapporto di prova contiene 6 pagine.
La versione inglese di questo rapporto di prova è l'unica versione ufficiale che fa fede.

Capriano del Colle, 30/07/2013

Ing. Michele Peschiera
Testing engineer

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<p>QUALILAB s.r.l. Via Trento, 87 - 25020 - Capriano Del Colle (BS) - info@qualilab.it - www.qualilab.it</p>

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13)WARRANTY.

LUXSOLAR - AERONAUTICAL LIGHTING

LUXSOLAR Warranty, Obstruction Lighting

C&E srl – “Luxsolar” warrants the purchaser and the final user of AWL LED beacons “Luxsolar” that at the moment of their purchase the products were exempt of shortages and conform with ICAO Annex 14 requirements.

3 years warranty for materials and labor

For a period of five years from the purchase date, “Luxsolar”, at its unchallengeable opinion, provides to repair or replace lacking product, directly or through other companies and people. Warranty is applicable only in case of factory default or assembly default.

3 years warranty for light degradation

For a period of five years from installation date, “Luxsolar” at its unchallengeable opinion, provides to repair or replace (directly or through other companies and people) the product having a light intensity 7% lower than the intensity required according to ICAO Annex 14 June 2004 rules .

Warranty does not cover: (1) advice or information complementary given by “Luxsolar”, (2) assembly and disassembly of products, (3) Fault or lacks caused by accidents, modifications, wrong use, environment temperature >55°C, voltage value higher than the indicated one, wrong maintenance, abuse, wrong installation and wrong storage.

Warranty conditions: (1)The user has to communicate and detail the shortage or the reduction of light intensity before the end of the warranty period; (2) Ship the product with a copy of the purchase order and the name of the original purchaser; (3) The user has to pre-pay all shipping costs (including insurance), from plant to Luxsolar and from Luxsolar to plant for repaired and/or replaced parts; (4) Luxsolar is authorized to detain repaired/replaced parts; (5) every six months, starting bill of material 's date, User has to send the maintenance module -entirely compiled- to Luxsolar service center, exclusively by FAX (no. +39-0341-577747). If this module will not be sent, warranty will not be applied to repair/replacement.

Warranty limitations: this warranty will not cover other suppliers' products. All the replaced/repaired products will be covered by warranty only for the remaining warranty period. The replaced products will not be necessarily identical to original ones, though having the same functionality. Repairs, replacements or compensations are the only remedies agreed by this warranty.

“Luxsolar” declines any other kind of warranty, included, without limitations, the implicit warranty of commercial use and suitability for other uses.

Damage limitations: Under no circumstances “LUXSOLAR” will be liable for incidental or accidental damages and loss of profits or savings - suffered by purchaser or third part - that may be caused by its products or by failure of its products. This limitation will be effective even if damage and loss have been caused by “Luxsolar” or its representative's negligence and even if “Luxsolar” is informed about the possibility of such damages and losses. This limitation of liability may not apply to damages relating to personal injury or death in jurisdictions where such damages may not be disclaimed as a matter of law.

To obtain warranty service, user has to ask (by fax +39-0341-577747) and obtain the authorization return number of material (ARM) from Luxsolar Service Centre.